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Volume 2017, Issue 11, 1 November 2017, Article number 85Search for pair production of vector-like T and B quarks in single-lepton final states using boosted jet substructure in proton-proton collisions at $\sqrt{s}=13$ TeV (Article)The CMS collaboration, Sirunyan, A.M.^a, Tumasyan, A.^a, Adam, W.^b, Ambroggi, F.^b, Asilar, E.^b, Bergauer, T.^b, Brandstetter, J.^b, Brondolin, E.^b, Dragicevic, M.^b, Erö, J.^b, Flechl, M.^b, Friedl, M.^b, Frühwirth, R.^{b#q}, Gheze, V.M.^b, Grossmann, J.^b, Hrubec, J.^b, Jeitler, M.^{b#q}, König, A.^b, Krammer, N.^b, Krätschmer, I.^b,[View additional authors](#) ∨^aYerevan Physics Institute, Yerevan, Armenia^bInstitut für Hochenergiephysik, Wien, Austria^qInstitute for Nuclear Problems, Minsk, Belarus[View additional affiliations](#) ∨

Abstract

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A search for pair production of massive vector-like T and B quarks in proton-proton collisions at $\sqrt{s}=13$ TeV is presented. The data set was collected in 2015 by the CMS experiment at the LHC and corresponds to an integrated luminosity of up to 2.6 fb^{-1} . The T and B quarks are assumed to decay through three possible channels into a heavy boson (either a W, Z or Higgs boson) and a third generation quark. This search is performed in final states with one charged lepton and several jets, exploiting techniques to identify W or Higgs bosons decaying hadronically with large transverse momenta. No excess over the predicted standard model background is observed. Upper limits at 95% confidence level on the T quark pair production cross section are set that exclude T quark masses below 860 GeV in the singlet, and below 830 GeV in the doublet branching fraction scenario. For other branching fraction combinations with $\mathcal{B}(T \rightarrow tH) + \mathcal{B}(T \rightarrow bW) \geq 0.4$, lower limits on the T quark range from 790 to 940 GeV. Limits are also set on pair production of singlet vector-like B quarks, which can be excluded up to a mass of 730 GeV. The techniques showcased here for understanding highly-boosted final states are important as the sensitivity to new particles is extended to higher masses. © 2017, The Author(s).

Author keywords

Hadron-Hadron scattering (experiments) Heavy quark production vector-like quarks

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